

What is claimed is:

1. A hydraulic steering system for vehicles comprising:
  - a hydraulic steering unit including a steering element for receiving steering input from an operator;
  - a closed-circuit pump in communication with the steering unit wherein the steering unit actuates the closed-circuit pump; and
  - at least one steering cylinder in communication with the closed-circuit pump wherein the closed-circuit pump actuates the steering cylinder to control the steering of the vehicle.
- 15 2. The hydraulic steering system of claim 1 wherein the closed-circuit pump is a proportional bi-directional pump.
- 20 3. The hydraulic steering system of claim 1 wherein the steering unit includes at least one servo pump in communication with the closed-circuit pump to actuate the closed-circuit pump.
- 25 4. The hydraulic steering system of claim 1 wherein the steering cylinder includes at least one counterbalance valve along the inlet to the steering cylinder to prevent actuation of the steering cylinder when there is no steering input from the operator.
- 30 5. The hydraulic steering system of claim 1 wherein the steering element comprises a steering wheel.

6. A hydraulic steering system for vehicles comprising:  
an electronic displacement control unit including a  
steering element for receiving steering input  
5 from an operator;  
a closed-circuit pump in communication with the  
electronic displacement control unit wherein the  
electronic displacement control unit actuates  
the closed-circuit pump; and  
10 at least one steering cylinder in communication with  
the closed-circuit pump wherein the closed-  
circuit pump actuates the steering cylinder to  
control the steering of the vehicle.
- 15 7. The hydraulic steering system of claim 6 wherein the  
closed-circuit pump is a proportional bi-directional  
pump.
8. The hydraulic steering system of claim 6 wherein the  
20 steering cylinder includes at least one  
counterbalance valve along the inlet to the steering  
cylinder to prevent actuation of the steering  
cylinder when there is no steering input from the  
operator.
- 25 9. The hydraulic steering system of claim 6 wherein the  
steering element comprises a steering wheel with  
electronic encoding devices that relays an electronic  
signal to the electronic displacement control unit.
- 30 10. The hydraulic steering system of claim 6 wherein the  
steering element comprises a joystick that relays an

electronic signal to the electronic displacement control unit.